

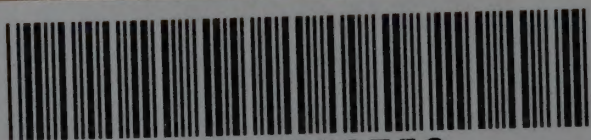
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The Vital Organs

Their
Use and Abuse



Susanna Cocroft



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THE VITAL ORGANS

THEIR USE AND ABUSE

THE STOMACH
PANCREAS
LIVER
INTESTINES
KIDNEYS

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THE VITAL ORGANS

THEIR USE AND ABUSE

BY

SUSANNA COCROFT

The purpose of these lectures is to describe as briefly as may be done comprehensively, the action of the digestive organs upon the foods in converting them into nourishment for use by the body, and to explain the disorders of the digestive tract, which give rise to chronic ailments.

The digestive system is the great chemical laboratory of the body in which the food undergoes various changes until it is put in condition to resupply the waste of the tissues and to provide heat and energy. It is composed of a series of organs, cavities and glands, arranged in such order that the action of each prepares the food for further modification by the next, until the process is completed in the absorption of the digested elements, and in the excretion of the undigested matter.

In order to replace the daily waste, it is necessary not only to supply the proper amount of food, air and water, in kind and quality, but a complete elimination of all refuse and poisonous matter is essential; every organ must be nourished by pure blood, must have a plentiful supply of oxygen, and must have sufficient room in which to carry on its normal activities.

Nearly every great epoch maker in the world's history has had a strong organism, as a result of free activity of the vital organs; his body has been uplifted, and in the "ready-for-action" physical attitude.

The freedom of action of the vital organs is so easy to maintain and yet so commonly violated, not more than 10 per cent of men and women standing in normal attitude, so that lungs, heart, stomach, liver, spleen, pancreas, intestines and pelvic organs are in correct position.* Measurements of eighteen thousand women show that the above organs of ninety per cent of them are from one to five inches out of place. This displacement is due to incorrect habits of standing and sitting, resulting from ignorance, negligence, indifference, or to physical, mental or moral weakness.

Imagine a hollow, flexible cylinder, in which are swung the delicate vital organs, being constantly bent forward, so that the organs and tissues on one side are continuously compressed, while the muscles, nerves and ligaments on the other side are continuously stretched.

The daily habits, both of work and pleasure, call for a forward position of the body. (Will some one invent a national game which shall call for a backward, bending movement? It would mean a marvellous renewal of health and strength to the nation.) The simple game of catching a ball, thrown high into the air, brings far more of health in its train than the forward movement of tennis or croquet. The swinging of the arms and the resultant strengthening of back, waist and abdominal muscles in golf, is the chief commendable feature of the game, aside from the fact that it calls the business man from the cramped position at his desk into the open air.

As well expect a sewing machine to do good work while it is clogged with dust, or while some heavy weight rests upon it, preventing the wheels from turning, as to expect the machinery of the body to do good work while it is clogged with waste, or while the weight of one organ is pressing upon another, holding it out of position, and interfering with the flow of blood or of nerve impulse.

An organ interfered with becomes weakened, and it is the weakened organ which succumbs to disease or cold. When disease attacks a patient, the physician, who makes a study of the pathological condition of the body, should

*Publisher's Note: See "Effects of Poise upon Health," by Susanna Cocroft.

be called; but in building up weakened muscles and tissues of vital organs, in correcting the position of displaced organs, in strengthening nerves, in correcting poise, so that the organs may have room for work, in establishing correct breathing habits, so that sufficient oxygen for combustion of waste may enter the system, the patient, by rightly directed exercise to strengthen the weakened organ, by the proper food, by correct breathing, and by correct habits of poise, can do more for herself through these natural means than medicine can do for her. The physician welcomes these natural aids.

Because of the marvellous power of bodily recuperation, every displaced organ is not diseased, but every displaced organ works under disadvantages, which may ultimately result in disease.

Physicians who have given attention to the necessity of normal position, for normal action, repeatedly state that they seldom find chronic disease in an organ which has been habitually carried in the position in which Nature placed it.

Effect of
Exercises
Upon
Digestion.

Exercise regularly relaxes and contracts the muscular walls, as well as the mucous coats of the digestive organs, thus making them active and efficient in secretion of the digestive juices; it brings a better circulation of blood to the organs and keeps the absorbing cells of the mucous lining, which are apt to become clogged, free and active, that the nutriment, when digested, may freely enter the blood. By correct breathing and quickened circulation, sufficient oxygen is brought to the tissues to cause a combustion of the waste.

The right use of the diaphragm in breathing gives the required natural continuous exercises for the stomach, liver, pancreas, spleen and intestines.

It is more necessary to directly reach the vital organs by exercise than to reach the extremities, and yet physical culture, to the majority, means merely gymnastics, directed largely to the extremities. The average physician of to-day knows comparatively little of the nature of

remedial physical exercise, to strengthen heart, lungs and vital organs.

The movements of the spinal cord, which stimulate the sympathetic nerves and the medulla oblongata, as well as exercises which stimulate and free the nerve plexuses, aid digestion by inciting normal secretion and absorption throughout the entire digestive system.

The Digestive Canal.

The digestive canal is a continuous tube, which broadens out at various points into smaller or larger pouches. In its entire length it is lined with a mucous membrane resting upon a sub-mucous coat. The mucous membrane is covered by a continuation of the skin, the skin being known within the body as the epithelial layer. Both linings are of considerable thickness along their entire course, excepting in the mouth and in the pharynx.

Within the mucous lining of the digestive tract are numerous cells and glands. The digestive juices are formed in the cells of these glands and are poured out through the unobstructed mouths of the glands upon the surface of the mucous coat. As the foods are carried along the alimentary canal, they are subjected to the action of these juices, which dissolve some of them and render others more or less soluble and diffusible, putting the proteids (tissue builders, e. g., lean meats) and the carbo-hydrates (starches and sugars) into a state for absorption by the rootlets of the portal veins, and the oils and fats into condition for entrance into lymph channels, through which they are poured into the blood stream. The digested products thus reach the blood, and new matter is brought to the tissues. The small, undigested parts of the food are excreted in the fæces.

Stated broadly, then, the process of digestion consists of rendering foodstuffs soluble and diffusible, so that they can pass into the blood. This digestive process is known as assimilation, but assimilation also means the metabolic activity by which the food is converted into cells and tissues.*

*Publisher's Note: For the course which the food takes after absorption, and the metabolic change into body tissue, see lecture upon "The Circulatory System," by Susanna Cocroft.

It is interesting to note that plants have their habits of digestion and secrete digestive juices. This is noted in the venous fly-trap, which closes upon a foreign substance entering it and secretes a digestive juice, thus killing a fly or any vermin within its reach.

For a comprehensive study of this lecture, the reader should have in hand the Body Manikin, the second of this series of lectures. A study of the foundation cut of this Manikin, with the cut of the intestines, and the stomach laid upon it, will enable one to trace the course of the foods from the mouth, through the pharynx (4), into the œsophagus (1), through the cardiac orifice (2), into the stomach (3), through the pyloric orifice (4), into the duodenum (5), which is a part of the small intestine (7), thence through cæcum (9), past the appendix (8), into the ascending colon of the large intestine (10), through the hepatic flexure (11), the transverse colon (12), the splenic flexure (13), the descending colon, which terminates in the sigmoid flexure (14), thence into the rectum which lies back of the bladder, out through the anus.

The entire circulation of the blood and of the nutrient elements in the food, as well as the conversion of foods into tissue, is fully covered in the lecture upon The Circulatory System.

Solid foods entering the mouth and passing through the body undigested, continue their course through the above organs in this order.

Saliva.

In the mouth the food is mixed with saliva, a secretion from the glands lying below the tongue and in the cheeks. Its function is to moisten the food, to stimulate the sense of taste, to aid in deglutition and articulation, and to dissolve the carbohydrates. Saliva does not aid in the digestion of proteids or fats.

After the starches and sugars are dissolved, the next process is to convert them into dextrin and grape sugar. (The sugar changed within the body is known as grape sugar.) Sugar seems to be the final form in which the products of digestion pass into the blood. In order to facilitate this conversion, the food containing the starch should be thoroughly boiled, so as to break the covering of the starch globules. The saliva acts slowly upon raw, unboiled starch. The conversion of starch into dextrin and sugar in the potato, unless boiled thoroughly, takes from two to three hours.

Tea has an inhibitory effect upon salivary digestion, as well as upon the peptic digestion of proteids, due to the large quantity of tannin contained therein; coffee and

cocoa have only a slight effect upon salivary digestion. Much alcohol destroys the ptyalin, which is the important digestive element in saliva.

Strong acidity of the stomach prevents the action of the ptyalin and consequently the conversion of the starch into dextrin. Thus where strong acidity of the stomach prevails, starches are difficult of digestion.

During sleep, no saliva is secreted, because the nerve centers which stimulate the flow are inactive. These reflex centers are in the medulla oblongata, in the region of the seventh and ninth cranial nerves.*

The centers of the sympathetic nerve fibres are also in the medulla oblongata. These nerve fibres are connected with the nerve cells of the brain and the thought of a savory morsel sometimes causes a rapid secretion of saliva, hence the expression, "the mouth waters," for certain foods. The question of likes and of dislikes for certain foods is largely one of cultivation, and the necessity of cultivating a taste for foods which are wholesome, and particularly needed by the system will be readily seen, as the sight of foods which are pleasing to the taste increases the flow of all digestive juices.

The nerve centers controlling the secretory organs of the mouth may be stimulated by movements of the spine, or by massage, and the secretion of saliva will follow. The secretion is also increased by cold water in the mouth, which stimulates the buccal nerves of the cheeks; thus, water taken at intervals during the meal, stimulates the flow of saliva and aids digestion; it also facilitates the mixing of the food with the gastric juice, thus preventing fermentation. It keeps the absorbing and secreting cells of the stomach more active. The stomach works better when moderately full. Water should not be used to wash down the food, else sufficient saliva will not be mixed with the food to dissolve the starches and sugars. Water taken before and after meals, and at rest periods during the meal, materially aids in building up flesh.

The food passes from the mouth down the œsophagus, a canal from nine to ten inches in length, and enters the stomach.

*See plate of the Nervous System in the Body Manikin.

THE STOMACH

The stomach is the most distended pouch of the digestive tube. It is composed of three muscular coats, which produce the movements of the stomach during digestion. Next to the inner muscular coat is the sub-mucous coat, which contains the nerves, the lacteals and the blood vessels. Within the sub-mucous coat is the mucous coat, containing the glands and the cells.

The length of the stomach in a person of normal size is about twelve inches, and its width from four to five inches. Its average capacity is about five pints.

The opening from the œsophagus into the stomach is termed the cardiac orifice. The opening from the stomach into the duodenum, the pyloric orifice. The distance between its two orifices varies, during digestion, from three to six inches.

In the process of gastric digestion, one must consider:

1. The secretion of gastric juices and its action upon the food;
2. The absorption of the products of digestion;
3. The movements of the stomach.

The Gastric Juice.

From the ends of the glands in the mucous lining of the stomach, pepsinogen, hydrochloric acid, mineral salts, a large amount of mucous and a liquid called rennet, are poured out. These five secretions are called the gastric juice, which, in connection with the saliva, and the oxygen brought into the stomach with the food, prepare a small part of the food for absorption through the lacteals and the blood vessels of the sub-mucous coat, and the rest for passage into the intestines. The finely divided mixture of food and gastric juice is called chyme.

The gastric juice has a strong acid reaction, a sour taste and a peculiarly characteristic odor.

Milk coagulates, or curdles, upon entering the stomach,

owing to the precipitation of casein, which is separated from the milk by the action of the rennet. The curd is later dissolved by the gastric juice. (Casein is the proteid in milk from which cheese is made.)

Milk should be drunk slowly. If taken rapidly, a large curd forms, clogging the entrance to the stomach, which sometimes causes pain; while if taken slowly, the small curds are more readily moved away from the orifice. The lactic acid ferments in gastric juice change milk sugar into lactic acid. This acid is bitter and when it forms in large quantities we commonly say milk "sours on the stomach."

A very minute quantity of fat is broken up in the stomach into glycerin and fatty acids; the action of the gastric juice upon fats is not fully determined, however. Some authorities state that fats remain in the stomach for a considerable length of time.

Fats are not absorbed through the walls of the stomach. The mucous lining of the stomach has very little absorptive power and almost all of the food which enters the stomach passes into the intestines.

The stomach always contains a certain quantity of gas, partly from the gases swallowed with the saliva, and partly from the gases which pass backward from the duodenum. Abnormal development of gases in persons suffering from gastric catarrh occurs from a fermentation of food in the stomach which has not been acted upon by the gastric juice. It may be that the secretion of juice is deficient either in quantity or in quality. Gastric juice is an antiseptic, and after the food has been thoroughly mixed with it, it will not ferment.

As soon as the food enters the stomach, the blood is called to the mucous membrane, and for perfect action a complete circulation of blood, must continue during digestion; thus mental activity, or any special bodily activity, which calls the blood strongly to other parts, is discouraged for at least an hour after eating.

The pouring of gastric juice into the stomach is intermittent. Prof. Powlow, the Russian physiologist, discovered in his experiments on dogs, that the gastric juice be-

gan to flow a few minutes after the sight of food which they liked. This condition probably occurs with the human being. The appetite is at once stimulated by the sight of a dainty lunch, daintily served, and the stomach "turns" at sight of mussy, soiled table linen or food untidily served. The importance of this psychic element in the preparation and serving of food should not be overlooked.

Nerves of Stomach.

The stomach is supplied by nerve fibres from the right and left vagi in the medulla oblongata and from the solar plexus. The nerves extend from the medulla oblongata along the œsophagus into the sub-mucous lining. Small ganglia exist in the course of these nerves. The ganglionic plexuses of nerve fibers and branches penetrate the muscular and mucous coats of the stomach, along with the arteries. The nerve cells which lie between the muscular coats of the stomach, are supposed to be the proper motor centers, the motor impulse being conducted to it by the vagi. The body of the stomach also possesses a few automatic nerve ganglia in connection with the vagi and the sympathetic nerves.

The thought of food, especially during hunger, excites the secretion of gastric juice, thus showing the direct relation between the nerves of the stomach and those of the brain. Nausea, caused by the thought of food which is repellent, by the sight of the motion of a boat, or of any swinging motion which has previously nauseated one, also shows the connection between the nerves of the stomach and the nerves of the brain. Prof. Powlow also observed that when dogs were teased, gastric digestion ceased entirely. Worry, excitement and disagreeable thoughts retard the flow of gastric juice, and give an opportunity for foods to ferment, while cheerful, happy thoughts favor the secretion of gastric juices.

We are told in sacred history that the disciples "ate their bread with gladness." This is an excellent text for a meal and should be especially observed with young children, or with adults of weak or delicate digestion.

Normal brain poise expresses itself in an immediate

stimulation of normal digestion. Here is a practical lesson in mental cures,—a belief which tends to a happy state of mind is *Physiological Science* and *Christian Sense*.

**Movement
of the
Stomach.**

As soon as the food enters the stomach, the gastric juices begin to pour out from the glands within the mucous coat, and the lower, or pyloric end of the stomach at once contracts. Contracting and relaxing waves, called peristaltic waves, begin near the pyloric end sweeping towards the pylorus. These contraction waves, which later sweep the food toward the pyloric end, gradually extend higher toward the cardiac orifice, until in about an hour the entire stomach is involved, and the food is thoroughly mixed with the gastric juice. In about four hours, if nothing has interfered with gastric digestion, the last vestige of food has moved by these waves from the stomach into the duodenum.

The food, by the contraction of the lower stomach, is held in the upper, or cardiac end, for some time, so that the salivary digestion may continue. The hydrochloric acid is secreted about the upper end of the stomach, but it does not at first penetrate to the center of the mass of food, acting only upon the outside of it, so that unless sufficient saliva has been mixed and swallowed with the food, microbic activity begins and the food ferments.

It has been observed by Professor Powlow, that a morsel of food swallowed whole cannot get by the pylorus; every time it reaches that opening, the pylorus closes decisively, forcing it back into the stomach to be again acted upon by the gastric juice. This accounts for the finding of whole oysters in the stomach of patients two and three days after they have been eaten. For some reason the stomach failed to digest them and the pylorus would not let them pass.

As the food is forced out of the pyloric orifice of the stomach by its peristaltic action, it enters the small intestine. The first twelve inches of the small intestine are called the duodenum and it is into the duodenum that the bile from the liver and the pancreatic juices from the pancreas are poured, to further aid in digestion.

THE PANCREAS

The pancreas is a long, narrow, tubular gland, of a cream color and of a soft texture, which lies across the posterior wall of the abdomen, behind the stomach and opposite the first lumbar vertebræ. It is about seven inches in length, nearly one inch wide, and one-half inch thick. It opens into the duodenum about four inches from the stomach. The broader end of the pancreas lies within a fold of the duodenum, at the upper right side of the abdomen, and the narrow end comes in contact with the spleen at the left of the upper abdomen. (See Figure 19 of the foundation plate of the Body Manikin.)

Running the entire length of the pancreas is a duct, which receives the juice from the numerous small glands opening into it at right angles.

The office of the pancreas is clearly for the manufacture of pancreatic juice, which is one of the most important of the digestive fluids. It is thick, transparent, colorless, odorless and saltish to the taste. It has a strong alkaline reaction, owing to the presence of sodium carbonate. Being one of the most important of the digestive fluids, it is necessary to give the pancreas plenty of room, and to see that it is regularly exercised, so as to keep up a normal circulation and metabolic activity.

Pancreatic juice acts as does the saliva upon the carbohydrates in changing them to sugar, but unlike saliva, it also acts upon the proteids, and upon fats, forming a fine emulsion. Sodium chloride (common salt) favors the activity of the formation of this juice.

Nothing certain has been determined regarding the pancreatic secretion in disease, but in fevers it is diminished in amount and in digestive activity.

As with all vital organs, the pancreas has its regular times of rest and activity. The secretion begins to flow when food is introduced into the stomach and reaches its maximum flow two or three hours afterward.

**Controlling
Nerves.**

The nerves controlling the pancreas are from the hepatic, splenic and superior mesenteric plexuses, with branches from the vagus, and the sympathetic nerves. Excitation of the medulla oblongata facilitates the secretion, as well as physical movements, so directed as to regularly compress and relax its cells.

THE LIVER

On account of the changes which the liver effects in the blood, it is undoubtedly the great metabolic, or creating gland, of the body. It is the largest gland and it probably causes as much chronic disturbance in the digestive tract as any other organ.

In a normal state, the liver contains about one-fourth of the blood of the body. It is about ten inches long, seven inches in width and three inches thick. It weighs from 50 to 60 ounces. Its upper surface is in contact with the diaphragm, extending from the right side of the upper abdomen nearly to the left. It is in contact on its lower edge with the intestines and the right kidney.

It is irregular in shape, on its under surface, and concave at its lower edge, giving room for the stomach. It has five lobes, the right and the left being the largest.

In substance, the liver is made of innumerable lobules about the size of millet seeds, which can be seen with the unaided eye. The lobules of the liver must be kept clean and active, and it is in keeping it free and active that the physical culturist, the masseuse, and the osteopath aid materially the digestive and the blood formative process.

Most people are familiar with the appearance of the liver of cattle and of fowl when removed from the body; the liver in man is similar in texture, though when in the body, and when the arterial blood is coursing through it, it is of a brighter red, softer and more pulpy.

**Circulation
Through the
Liver.**

The arterial blood which rebuilds the tissues of the liver and aids it in doing active work, is supplied by the hepatic artery. The food stuffs from the stomach and intestines, which are not carried into the venous stream through the lymphatics, are carried by the portal veins into the liver. (The portal veins are distinguished from the rest of the venous system by the fact that they carry digested food from the intestines and the stomach to the liver, instead of carrying blood to the heart.) The portal veins, upon entering the liver, diverge into smaller veins after the manner of arteries, continuing to diverge into the veinlets and capillaries until the capillaries out in the midst of the tissues are very small. The blood oozes out from the capillaries of the portal veins, and is picked up by the capillaries of the hepatic veins, which converge until they join to form one large hepatic vein, which carries the blood into the inferior vena cava.

Thus all of the food products are carried by the hepatic vein and lymphatics from the stomach and intestines, into the blood stream.

The reader will readily trace the circulation of the blood from the intestines and the stomach through the portal veins into the liver, also the converging of the bile ducts, by referring to the inner section of the liver on the Body Manikin, bearing in mind that this illustration shows the liver cut in two and turned up, so that the gall bladder is shown at the upper part of the liver, where if laid back again in its natural position it is in the lower part, as shown by the outside cut of the liver in the Body Manikin.

Nerves.

The nerves controlling the liver are branches of the sympathetic and branches of the right and left vagi to the hepatic plexus; the hepatic plexus is that part of the solar plexus which embraces the portal vein, the bile ducts and the hepatic artery. They accompany the arteries, and ganglia appear on their branches within the liver. Some of the nerve fibers are vaso-motor in function. (That is, they regulate the tension of the blood vessels.)

The liver has many offices:

1st. It secretes bile;

2nd. It works over the products of digestion from the stomach and intestines (excepting the emulsified fats and oils, which are directly absorbed by the lymphatics)

changing the nutriment into new cells and converting the old cells back into waste.

As stated above, the liver is a gland, and a gland is merely a collection of producing or secreting cells, and, in a measure, filtering cells, the function of which is to filter out from the blood certain fluids. How far the filtration is mechanical and how far it is chemical, that is, a process of manufacture, is not known.

The filtered elements reunite to form new and different substances.

3rd. It forms glycogen (a white powder commonly known as animal starch), which is used to produce body heat and energy. Glycogen is formed partly from proteids, but largely from the carbohydrates (starches and sugars). In an unaltered and diffusible form it passes into the blood stream. The liver is, therefore, a store-house for carbohydrates, and serves them out to the economy as they are required.

The storing up of glycogen is influenced by the season of the year. There is need of increase of body heat in winter, hence Nature provides for the winter, foods rich in fats, and root vegetables containing much starch.

4th. By storing up the sugar in the glycogen, it prevents the blood from being overwhelmed with sugar; it also prevents a deficiency in the formation of sugar. (If the hepatic circulation be interfered with, and too much sugar be formed from starches, the result is that the sugar must be excreted by the urine. The overabundance of sugar in the urine results in diabetes.)

5th. It forms new blood corpuscles, and destroys the old ones. The blood flowing from the liver is richer in blood corpuscles, both white and red, than that which flows into it.

6th. It forms urea and other metabolic products. The urea, formed by the liver, is carried into the blood stream, until the blood reaches the kidneys, at which point, with certain other poisons, it is poured into the bladder and

expelled. A small portion of urea is also eliminated through the skin.

7th. It converts many poisonous products of putrefaction into harmless compounds.

It is, therefore, the great watch-dog of the body.

Effect of Food.

During hunger the liver cells are finely granular. During activity, after a full meal, especially of starchy food, the cells are larger, more distinct and contain fewer granules. The formation of bile in the liver is increased by a meal consisting largely of proteids; less is secreted after vegetable food. A very small amount is secreted after a purely fat diet, and secretion ceases during hunger. In a meal consisting largely of starches and sugars, more glycogen is formed, and the cells become so large as to compress the capillaries, thus interfering with portal circulation.

Often where the liver is torpid, or is overworked by a diet of too much starch and sugar, it is beneficial to fast for a day or so, or to feed upon an all proteid diet.

A meal consisting of but one kind of food is troublesome for the liver to manage, therefore each meal should consist of proteids, oils, fats and carbohydrates. The danger to those who follow a vegetarian diet is in eating too much of carbohydrates and fats and not a sufficient quantity of proteids. They must therefore guard against diabetes or anæmia. One who abstains from meat should see that a proper amount of proteids be consumed in nitrogenous vegetables, fruits or nuts.*

Fatty granules are of common occurrence within the liver, but if they become too numerous they interfere greatly with the function of the cells.

Bile.

Bile is a yellowish brown, or dark green fluid, with a sweetish and strongly bitter taste. It is secreted by the liver cells, and is gathered up by minute bile ducts, which converge to form the chief bile duct.

It is secreted into the glands continuously, but the greater amount is secreted from three to five hours after eating. It is poured into the intestines only at certain intervals; at other times it is stored up in the gall bladder,

*Publisher's Note: See lecture by Susanna Cocroft upon Foods.

which is a pear-shaped sac with the broad end downward, suspended upon the lowest margin of the liver, just over the stomach, to the right. Difficulty with the gall bladder is often mistaken for stomach disorder. The gall bladder is simply a reservoir for bile, and at certain intervals the bile is poured out of it into the duodenum.

The formation of bile is largely dependent upon decomposition of red blood corpuscles, as they supply the material for some of its constituents.

The functions of bile are:

1. To aid in the digestion of certain foodstuffs;
2. A part of it is absorbed, to assist in the elaboration of the blood;
3. It plays an important part in the absorption of fat in the small intestines, by emulsionizing neutral fats. When the walls of the small intestines are moistened with bile, the fatty particles pass more easily through them.
4. By exciting contraction of the muscular coats of the intestines, in the peristaltic waves, it contributes to absorption of foods through the mucous lining;
5. A part of it is excreted with the fæces;
6. It moistens the walls of the intestines and gives to the fæces their normal amount of liquid, which assists in evacuation;
7. It diminishes putrefactive decomposition in the intestinal contents.

The Outflow of Bile.

A relatively small amount of exercise, which means a sluggish circulation, causes bile to stagnate in the bile ducts.

A catarrhal condition of the duodenum often clogs the opening of the bile duct with mucous, preventing the outflow of bile, and if the outflow from the gall bladder or the secretion into the bile ducts be interfered with for any length of time, the gall bladder and the liver become distended, sometimes causing jaundice, or abscesses of the gall bladder. If the secretion be interfered with, watery bile passes from the liver into the blood, even to the amount of four times the weight of the liver, thus causing

*Publisher's Note: See lecture by Susanna Cocroft upon Obesity.

too great a dissolution of the red blood corpuscles; and very soon thereafter hemoglobin appears in the urine.

On account of the dissolution of too many red blood corpuscles, as a result of too great an absorption of bile, persons afflicted with anæmia should especially attend to keeping the liver active, and the bile ducts free and open. Even when the pressure is very slight within the portal veins, bile may pass into the blood, without any obstruction to the bile duct being present. Bile passing into the capillaries in too large amounts, gives the yellow tone to the skin.

The most pronounced external symptom of the absorption of much bile is the yellow tint or jaundice. The skin becomes deeply colored. When there is much bile pigment, the urine is colored a yellowish brown; the fæces are clay-colored, because the bile is not passing into the intestines in normal amount. The heart beats are greatly diminished, due to the action of the bile cells. The nervous system, also, is affected, as shown by the general sensation of fatigue, weakness and drowsiness. Sometimes there is sleeplessness, itching of the skin and even spasms.

Drugs for the secretion of bile, should be given guardedly and by a physician. "Aloes, rhubarb, and senna increase the secretion of bile. Magnesium sulphate, castor oil, ammonium chloride, manganese sulphate, and calomel stimulate the intestinal glands, but not the liver. Sodium sulphate and baptism act with considerable power, both on the liver and the intestinal glands. Cold diminishes the secretion of bile.

It is not known whether such substances as stimulate the secretion do so by causing the excitation of the mucous membrane of the small intestine, and thereby influence reflex excitement of the liver, or not. Their action, however, does not seem to be due to an increase in the blood stream through the liver."

It is important to remember that bile, even after it reaches the intestines, is liable to be too much absorbed unless it be carried down the intestines; hence, in giving a drug which is an hepatic stimulant to excite the secretion

of bile, a drug must also be given to expel it; or the hepatic stimulant must be combined with one to stimulate the muscles of the intestines.

**Freedom of
the Liver.**

Active exercise, causing a rapid blood supply, is more permanently effective than any drug. In exercise for the liver contractions and relaxations should be quick and expulsive.

One requisite for the proper action of the liver, is normal blood, and in order to make normal blood, judicious food must be eaten, assimilation be kept active, and plenty of oxygen must be taken into the system.

In the normal breathing action, the diaphragm regularly compresses and relaxes the liver, but in the habit of breathing in ninety per cent. of mankind the diaphragm never fully contracts and compresses it.*

The inspiration in normal breathing, assists the flow of blood in the hepatic veins, and the expiration increases the pressure within the abdomen, thus favoring the current in the portal vein.

The liver is probably the most overworked organ of the body and it is of utmost importance that it be not restricted by dress or physical poise; compression of the rib-cage, at the waist, or above it, materially restricts its activity, and the rib-cage depressed from incorrect poise cramps it.

Exercises which regularly contract and relax this organ, forcing the circulation of blood through the hepatic vein, so as to keep every capillary clean and well nourished, should be the daily practice of every intelligent man and woman, because lack of exercise causes the bile to stagnate in the bile ducts.

Torpid liver, as a rule, means slow brain action. The national characteristic greeting of one of the older races was, "How is your liver?" A very potent greeting, because by the condition of the liver was determined the jubilant or the depressed state of mind.

The compression of the liver not only interferes with the circulation by clogging the portal veins, causing piles

*Publisher's Note: See lecture by Miss Susanna Cocroft upon Breathing in "The Circulatory System."

or hemorrhoids, but it also tends to a retrogressive action, causing a congestion of the lining of the stomach.

When the bile passes into the stomach, as in vomiting, the acid of the gastric juice unites to form bile salts; this deranges gastric digestion by shriveling proteids, which can only be peptonized when they are swollen.

THE INTESTINES

As the food is forced out of the pyloric orifice of the stomach into the duodenum, the bile, in a normal condition, at once begins to pass from the gall duct, the pancreatic juice from the pancreas, and the intestinal glands begin to secrete their appropriate fluids.

The intestinal tube is ten times the length of the torso, measured from the vertex to the anus. It is from 17 to 35 feet. It is divided into the small and large intestine, the upper twelve inches of the small intestine being known as the duodenum. The length of the small intestine, in a medium person, is about twenty feet. At the juncture of the small and the large intestine is the cæcum, to which is attached a blind, finger-like pouch, the vermiform appendix. The chief function of the cæcum is evidently for absorption, as is shown by the great number of lymphatics within its wall. The function of the appendix is not fully known. The entire length of the intestine is laid fold upon fold within the abdominal cavity, as shown on the cut of the abdominal viscera in the Body Manikin.

Between the small and the large intestines is a valve known as the ileo-cæcal valve, which prevents the contents of the large intestine from passing backward into the small intestine. When water or food is injected into the rectum, it passes upward to this valve, but never through.

The walls of the intestines consist of four coats, which from without inward are named serous, muscular, sub-mucous and mucous. The serous coat has the same con-

struction as the peritoneum; the muscular coat is composed of muscular fibre; the sub-mucous coat consists of loose connective tissue containing the blood vessels, the lymphatics and the nerves. The mucous coat is the inner, and contains the glands for the secretion of the intestinal juices and the cells for the absorption of the nutrient elements in the food after they have been put in condition by the bile, the pancreatic juice and the intestinal juices.

Intestinal Juices.

There are two distinct juices secreted by the intestinal glands. They are light yellow and strongly alkaline. The glands within the duodenum yield a thin secretion, while those of the large intestine yield a large amount of sticky mucous. They convert cane sugar into the absorbable grape sugar, and further the action of saliva and the pancreatic juice. They slowly peptonize food, and partly emulsify the fats.

The mucous lining of the small intestines is laid in folds called valvulæ conniventes, which with the villi or "sucking cells," draw the nutrients of the food, which has been put into condition for absorption, into their cells, where it is taken up by the small blood capillaries and lacteals of the sub-mucous coat. The large part of absorption takes place in the small intestine (all fats are absorbed here.)

Only a small amount of the intestinal juice is poured into the large intestine, but a great amount of absorption goes on here, as is shown in the fact that as the faeces enter from the small into the large intestine, they are thin and watery. As they proceed along the intestine, they become more solid. The absorptive power is illustrated in the fact that a patient may be kept alive by food injected into the large intestine. It particularly absorbs unchanged fluid, such as egg albumen, milk, flesh juice, a solution of gelatine and myosin, with common salt. Egg albumen, without common salt, is not absorbed from the intestine.

Water and soluble salts, necessary for nutrition, are absorbed by the blood and lymph vessels. If large quantities of salt, such as magnesium or sodium sulphate, are

introduced into the intestine, the salts retain the water necessary for their solution and may thus cause diarrhoea. Conversely, when these substances are injected into the blood, a large amount of water passes from the intestine into the blood, so that constipation occurs, owing to the contraction of the intestinal contents.

**Controlling
Nerves.**

The nerves of the small intestine come from the superior mesenteric plexus. (See plate of the Sympathetic Nervous System in the Body Manikin.) The large intestine is supplied by branches from the inferior mesenteric and hypogastric plexuses, and the intelligent physical culture teacher gives exercises to definitely reach these nerve centers. The stimulation of the vagus, in the medulla oblongata, increases the movement of the small intestine.

The intestinal canal also contains automatic motor nerve centers, lying within the muscular coat.

The action of the nerves on the secretion of the intestinal juices is not well determined, though it is perfectly clear that the nerves influence the secretion to a very great degree, as both intestinal and gastric juices are diminished in certain nervous affections, while in others they are increased.

Branches of the mesenteric arteries pass between the layers of the peritoneum to the intestines, and in order that the normal activity be kept up here, there must be a good circulation of arterial blood through the coats of the intestines.

**Movements
of the
Intestines.**

The food is mixed with the digestive juices in the intestines by regular constriction of the walls at short distances apart, with bulging between each constriction ring. The next constriction begins where the bulging was before, and the bulging where the constriction was. These bulging and constriction movements take place regularly thirty times a minute for about a thousand times, when suddenly they cease, as if some one had commanded them to do so, and a peristaltic wave,

like that of the stomach begins, which sweeps the food on a short distance; then the bulging and constriction begin again and continue for another thousand times, then cease, and another peristaltic wave forces the food a little further, and so on until the food is thoroughly mixed with the intestinal juices, and the portion not absorbed is gradually passed along the intestinal tube until it is ejected from the rectum. The constriction and bulging, if sufficiently strong, create the necessary exercise to bring the blood to the intestinal walls, and to stimulate the absorption of the digested food.

Fubini estimates that it takes a smooth piece of sealing wax fifty-five seconds to travel two-fifths of an inch along the intestines.

In the large intestine, the peristaltic movements are more sluggish and less extensive, but they may be both seen and felt when the abdominal walls are very thin. They may also be seen in hernial sacs.

The vigor of peristaltic movements is effected by the nerves, by the strength of the muscular coat, by the amount of water consumed and by the amount of bile secreted. This movement is also seen very definitely in the body of a snake, just after it has swallowed food. It is worth while to watch the movement of food down the length of the stomach, which extends almost the entire length of the snake.

The movement of the stomach and intestines ceases during sleep, yet absorption and digestion go on, though not with the same vigor.

The contents of the small intestine remain in it about three hours, and about twelve hours in the large intestine. The quantity of water taken with the food has but little effect upon the amount of water in the fæces. Water is largely absorbed by the blood, but water aids materially in the energy of the peristalsis, both of the stomach and intestines, and the more energetic the peristaltic movement, the more rapidly the food passes along the intestine.

Intestinal Fungi.

All foods not digested and absorbed before reaching the large intestine, undergo fermentation and putrefaction, owing to the fungi present here. These fungi are lower organisms and are often called putrefaction producers. They are swallowed with the food, air, drink and with the saliva. They are everywhere in the atmosphere. One of the most common illustrations of the fungi is the yeast plant, with which nearly all are familiar.

The intestinal tube is particularly adapted for development and reproduction of this growth. The presence of yeast may cause a formation of alcohol in the intestine from milk sugar, which has first been changed into dextrose.

Aside from the fungi present in the intestines, microbes exist throughout the entire intestinal tract. Certain of these microbes probably contribute to the dissolution of food in the intestines.

Evacuation

The fæces are carried along by the peristaltic movement until they reach a point a little above that part of the rectum which is surrounded by the sphincter muscles, consisting of the internal and external sphincter.

As long as the fæces lie above the rectum, they do not excite any conscious sensations. The desire for evacuation of the bowels occurs when the fæces pass into the rectum, and at the same time, the stimulation of the sensory nerves of the rectum causes a reflex excitement of the sphincter. (The center for these movements lies in the lumbar region of the spinal cord.)

The evacuation of the fæces, which occurs at regular times, as do all bodily habits, begins with a lively peristalsis of the large intestine, which passes downward to the rectum. The strength of peristalsis can be aided by the rapid voluntary contraction and relaxation of the external sphincter muscle, whereby the nerve plexus of the large intestine is stimulated. The expulsion of the fæces is also aided by the abdominal muscles most efficiently at the close of a deep respiration.

The amount of excretion depends very largely upon the character of the food, the amount being less after a diet of milk, flesh and albumin, than after a diet of vegetable matter, because the former are nearly all absorbed. The fæces contain: portions of digestible substance which have been taken in too large amounts, or have not been sufficiently broken up by chewing, also the refuse of muscular fibre, cartilage, particles of fat, some bile and vegetable cells. All foods yield a certain amount of residue.

From the cæcum onward the contents of the intestine assume the fæcal odor. The fæcal matter is formed and rounded in the lower part of the large intestine.

Between evacuations, the fæces appear only to reach the lower end of the sigmoid flexure; as a rule, thence downward, the rectum is normally devoid of fæces.

Immediately after the expulsion of the fæces, the internal sphincter muscle contracts vigorously and remains so for some time. Afterwards it relaxes and the muscles which surround it suffice to keep it closed.

THE KIDNEYS

While the kidney is in no way a digestive organ, it may properly be treated here, because it plays so important a part in the elimination of waste matter. By reference to the foregoing pages, and to the lecture upon the Lymph and its offices in connection with "The Circulatory System" we may see that the tissues are nourished by the Lymph, which contains the nutrient elements of the foods. As a result of the activity of the tissues, these nutrient elements are formed into new tissues and cells and the old tissues and cells are broken down into waste, which is removed from the tissues either by lymph channels or by the capillaries and veins. In all cases the waste matter enters the blood and is eliminated from the blood through the kidneys, the lungs, the skin and the fæces. If the waste products accumulate, they injure the tissues.

The chief waste products are urea, allied nitrogenous substances, carbon dioxid, salts and water. The kidneys eliminate about sixty per cent of the water of the system, urea, nitrogenous substances and most of the salt. The skin eliminates the water, a small portion of uric acid, the salt and carbon dioxid, and the lungs eliminates carbon dioxid and watery vapor. The skin and lungs together eliminate about forty per cent of the water. The liver also excretes substances in the bile, which are discharged through the fæces.

The kidneys are glands, tubular in form, "covered by a thin, tough fibrous capsule, which is easily stripped off from the substance of the organ, to which it is attached by a thin process of tissue and blood vessels." They are situated in the upper posterior part of the abdominal cavity, the larger part being situated just above the waist line. Each kidney acts independently of the other.

They are light brown in color and are easily movable. Dr. M. L. Harris, as a result of actual measurements of women, states that the kidneys are movable in the case of fifty-six per cent of women, owing largely to the compression of the middle zone of the body either by clothing or incorrect poise.

In the adult, the kidney is about 4 4-10 inches in length, and about 2 inches wide, weighing from four to six ounces.

The kidney is abundantly supplied with blood by the renal artery (v, as shown on the Body Manikin), which divides into four branches; these continue to divide until they are exceedingly small, as is the case with the other arteries, finally forming a dense net-work of capillaries. The veins proceed from this capillary net-work, converging into the interlobular veins, finally uniting in the renal vein (w, as shown on the Body Manikin). During secretion, the blood in the renal veins is bright red.

The nerves to the kidneys form small trunks, provided with ganglia, accompanying the blood vessels. They are from the renal plexus and the lesser splanchnic nerve. The nerves from the renal plexus are chiefly from the solar plexus. They are controlled by both the left and

the right vagus. The secretion of urine is effected through the vaso-motor nerves, by regulating of the velocity of the circulation.

Urine.

By a knowledge of the components of the urine excreted, physicians are able to determine to a great degree whether certain food elements are consumed or excreted in too great proportions, especially the albuminoids and the sugars; also whether too much uric acid is formed in the system, by an over abundance of meats, or whether the uric acid is hoarded in the system because of imperfect oxydation.

The kidneys are, therefore, the sentinels of the body, reporting the character and quantity of food, used and eliminated.

The quantity of urine passed by an adult man in twenty-four hours is about fifty ounces; in woman, it is less.

When the skin, for any reason, is inactive, so that it does not excrete its normal amount of salt, water and uric acid, the kidneys are obliged to do the work of the skin and may thus be overworked.

The amount of urine secreted is diminished by profuse sweating, which eliminates more of the waste from the skin, and in cases where the kidneys are overworked, it is therefore, imperative that the secreting glands of the skin be kept active. Diarrhoea, which eliminates a large quantity of water, also diminishes the secretion from the kidneys. Thirst and foods devoid of proteids, diminish the blood pressure in the kidneys, therefore decreasing the elimination.

The elimination is increased by quantities of water, which increases blood pressure, contraction of the skin through the action of colds, and increase in the proteids, as well as by various drugs, such as digitalis and alcohol.

The color of the urine varies as the amount of water varies. Urine after meals, or the first passed in the morning is darker. It is usually dark colored in fever.

The Ureter.

The urine leaves the kidney through a small tube known as the ureter. (See 24 of the Foundation plate of the Body Manikin.) The urine is pro-

pelled along the ureter by the pressure of the urine in the kidneys and by the force of gravity, as well as by the peristaltic action of this tube. Every three-quarters of a minute, several drops pass into the bladder, which is simply a receptacle for the urine.

Urea.

Urea is the chief solid constituent of urine. It is composed of carbonic acid, ammonia and water. It composes from two to three per cent of the urine. The amount of urea increases with the increase in the amount of proteids in the food. It is also increased by large draughts of water, by various salts, by frequent urination and by exposure to compressed air. It is generally conceded that urea, as well as uric acid, is formed in the liver.

Uric Acid.

Uric acid is of the same component elements as urea; it is formed by decomposition of urea. It is the nitrogenous substance, which, next to urea, carries off most of the proteids from the body. The proportion of urea to uric acid in the kidneys is about forty-five per cent.

Uric acid in the system varies according to the amount of proteids in the foods. Where an overabundance of uric acid is formed, or where that formed is not eliminated, by coming in contact with sufficient oxygen, it is stored up between the muscular tissues and about the joints; the condition which results is known as gout. Muscular exercise frees the uric acid stored up and causes a combustion by bringing it in contact with the oxygen taken into the system through deep breathing. After muscular exercise and deep breathing more of it is found in the kidneys and eliminated from the system.

In gout, the amount of uric acid excreted is small, owing, doubtless, to the fact that it is deposited between the muscular fibre in the blood and about the joints.

Albumin in the Urine.

Albumin is perhaps the most important abnormal constituent in the urine, which engages the attention of a physician. It occurs but rarely, however, and sometimes in healthy individuals, when there is an excess of albumin in the blood plasma as a result of too free use of albuminoid foods. Very violent

muscular exercise would increase the amount of albumin in the urine, especially in persons who have a small amount of fat or carbohydrates stored up to supply the heat and energy required in violent exercise, the albumin in the food being then called upon to be consumed as fuel and energy. In the event of too much albumin in the urine, it should be regulated by regulating the amount of albuminoid proteids.

FOODS FOR NUTRITION

In this connection, it is necessary to hint, that all foods are lacking in some of the elements needed to maintain the body in health. Whole wheat flour, though abounding in phosphorus, is lacking in silicon, potatoes are lacking in proteids, iron and phosphorus, and milk in enough, in quantity, of nutritious elements to repair the waste resulting from the hard work done by an adult. That is, some foods are deficient in certain elements of nutrition, while others are abundant in these, but lack what the former had. Consequently, in order to meet these varied deficiencies the dietary should consist of a large variety of food-stuffs.* Should this be, mal-assimilation, faulty metabolism and mal-nutrition would be reduced to a minimum.

It is easily seen that along with the taking of food-stuffs, proper in quantity and quality, it is necessary that the secretions of saliva, and of gastric juice be normal and that the pancreatic juice from the pancreas is poured into the small intestines along with a sufficient amount of bile, not only to neutralize the acid chyme that is poured into these from the stomach, but that the digestive and absorptive functions of the liver, small intestines and pancreas are coaxed into a proper performance of their work. When this is done, the absorption, and later the assimilation, will be right, and the sprightly step and rosy cheeks will proclaim the wonder triumph of the exercise of these organs.

*Publisher's Note: For food values, see lecture upon Foods by Susanna Cocroft.

SUMMARY

The mechanism of the human body is certainly most wonderful. The action of one juice puts the food in condition to be acted upon by another, and so on until it is ready for absorption and assimilation as body tissues. The saliva puts it into condition to be acted upon by the gastric juice in the stomach; the gastric juice puts it in condition for the pancreatic juice, the bile and the intestinal juices.

As the food passes through the digestive canal, the above juices ooze out from glands in the mucous lining, very much as the saliva oozes from the glands of the mouth. These juices dissolve and change the food so that it is in condition to enter the absorption cells.

When the food is put into condition for absorption, it is sucked into the villi of the mucous coat and taken up by the capillaries of the portal system and by the lacteals, and conveyed through the portal veins to the liver, or through the lacteals into the lymphatic ducts, where it is poured into the venous stream. The foods from the portal veins are further changed within the liver before they enter the vena cava through the hepatic vein.

The food is moved through the stomach and intestines by strong peristaltic waves of relaxation and contraction of their wall; as it passes along, the nutritive elements are absorbed and those not needed by the system are expelled.

The entire intestinal tract, from the cardiac orifice of the stomach to the anus, is adapted for absorption; a small part of the food being absorbed in the stomach, and that portion which the capillaries and lacteals of the stomach will not absorb, is moved onward into the intestines; the larger part of the food being absorbed in the intestines. Most of the neutral fats are emulsionized and are absorbed in the small intestine.

By assimilation is meant the process of transforming food into such a nutrient condition that it is taken up by the circulatory system, also the process by which the nutrient in the food is converted into organized tissue.

The conversion of the food into chyle and blood is discussed fully in the foregoing pages. The metabolic activity, or the assimilation of food, whereby the nutrient elements are converted into bone and tissue and thus become a part of the body substance, is considered fully in the third lecture of this series, "The Circulatory System."

DERANGEMENTS OF THE ORGANS OF DIGESTION AND ELIMINATION.

Nearly all of the diseases of the alimentary tract are due to a lack of activity of the organs, to an over-tense or weakened condition of the nerves, to poor circulation, to insufficient oxygen, and to improper diet, resulting in an incomplete digestion, or in a failure to convert the nutriment into blood cells and tissue, which failure is known as mal-assimilation. The result is mal-formation of the blood. The most serious of these diseases are Gout, Bright's Disease, Anaemia, and Diabetes. Manifestly the blame is to be laid upon deficiency in diet,—that is, the foods are lacking in the constituent elements necessary for a healthy body,—or to the absorption cells of the small intestines. When the absorption cells are irritated by the presence of improper or poisonous substances, by toxins produced by the bacteria present in these organs, or by undigested particles in the small intestines, the blood capillaries of the villi do their absorbing, or sucking, of the dissolved foods improperly, or not at all, and in consequence, the blood is lacking in some of its elements.

The purpose here is to give the causes and relief of only such chronic disturbances in the digestive system as can be relieved by exercise, breathing and proper diet. Those which require the assistance of medicines to counteract bacteria are not here treated. It must not be inferred that many of these difficulties are not helped by exercise, because every bodily ailment depending upon complete, forceful circulation, good blood, oxygen for the elimination of waste and strength of the muscular tissues, with increased activity in the formation of new cells and in the breaking down of the old ones, is materially helped by regular exercise, accompanied by deep breathing, by the diet adapted to the condition and by the right use of Nature's free gifts,—water, air, and sunshine.

For centuries humanity has pinned its faith to drugs. The lack of knowledge of the human body by the laity, and the consequent ignorance of the application of the ordinary hygienic rules, has led to the employment of a physician upon the slightest provocation. Yet the physician, as a rule, is not employed or his directions upon hygiene not followed for a sufficient length of time, being discharged, as a rule, when the acute suffering is relieved; this has led to the study of the prescription of medicine for quick relief by the medical profession, to the exclusion of Nature's means, which are slower but more permanent in effect.

The narrowing of the study of relief from disease has given rise to the professions of the educated physical culture teacher, to osteopathy and to massage. All medicines or drugs in any form should be taken only upon the advice of a physician. If the individual has strength of character sufficient to practice regular daily exercise, she can get a better massage of the

vital organs by judicious, intelligent movements for these organs than can be given by the manipulation of the hand of another, because she reaches deeper and her mind, working with the body, give a better strength of nerve and brain cells. She also generates electricity in the nerve centers of the body by friction of exercise. It requires more strength of character and more will-power to follow a regular course of remedial exercise by oneself, but the result pays a hundred fold in the development of a strength of every vital organ, in a clearer mental concentration, strengthened memory and in a better mental, moral and physical poise.

The chronic ailments successfully relieved by exercise follow:

Anaemia. Anaemia is a condition of the blood due to a lack of red blood corpuscles.

It may be caused:

1—By a deficiency in the quantity or quality of food containing the elements necessary for the formation of red blood corpuscles;

2—By the failure of the cells of the villi in the mucous lining to absorb all elements in the food. (If the digestive tract is not doing its proper work, no matter how much food is consumed, the body tissues are starved because red blood cells are not being formed.)

3—By the destruction of the blood-making properties of the iron by the bacteria of the intestines acting upon it.

4—By too much bile being absorbed by the system, causing a decomposition of too many red blood corpuscles.

If nourishment is withheld from any tissue, it first becomes anaemic and then atrophies, thus losing its functional powers.

The waste of the system, together with the lack of red blood corpuscles, expresses itself in pallor of a yellowish hue.*

In the relief of anaemia, the activity of the absorptive cells of the stomach and intestines, gained through regular exercise, is of the utmost importance, since it is the food we absorb and assimilate and not what we eat which counts. The importance of pure air, deep breathing, and exercise, in the relief of anaemia cannot be overestimated. Since the red blood corpuscles carry the oxygen, these being deficient, the oxygen is deficient in anaemia; where pure air is lacking the oxygen is still more deficient and much waste accumulates. This waste often becomes infected, resulting in the formation of pus, causing abscesses. The importance of exercise and deep breathing will thus be readily seen in the necessity for the relief of the waste.

The red blood corpuscles are formed in the red marrow of the bones, and exercise, creating a free activity of all joints, is especially valuable. Meat packers now provide a preparation made from the red marrow of the bones of calves, known as "Red Bone Marrow," which is sold through druggists.

In anaemia, careful attention must be given to diet in the selection of food containing iron and red blood,—notably, spinach, beets and the red blood of the beef.

Rheumatism and Gout. Medical science is entirely at sea in regard to the cause of rheumatism. There are three theories, none fully substantiated.

One is that it is caused by infection, the other by disturbance in the nerves to any part, and the other is mal-assimilation. The theory of mal-assimilation, which results in too much lactic acid, has been given

*Publishers' Note: For further information in regard to anaemia see lecture upon "The Circulatory System," by Susanna Cocroft.

greatest credence, though the nerve theory is fast gaining ground. There is no doubt that many nerve difficulties as well as many cases of gout have been treated as rheumatism. The fact that it almost always accompanies obesity may either support the nerve or the metabolic theory, since mal-assimilation in obesity is often due to nerve weakness.

When for any reason the digestion of the food is retarded in the stomach, the starches and sugars are apt to ferment and form lactic acid. The lactic acid is absorbed by the blood reducing its normal alkalinity. When a large amount is absorbed, it causes an irritation of the membrane lining the joints or the connective tissue holding together the bundles of muscle fibre. This irritation results in redness and swelling with great pain.

The disturbance in the nerves to any part affects the tissues, the circulation, and the elimination of waste to that part.

Gout is similar to rheumatism in its appearance and in painful manifestations; and like rheumatism is due to a digestive fault, which renders the blood less alkaline. In gout, however, the trouble arises in the liver, from an excessive formation of uric acid, due to an over large meat diet. The pancreatic juice liberates the ureates in the animal food and these are hurried on to the liver for further action. If the liver is being overworked, the ureates are decomposed and uric acid is formed. This is taken up by the blood and deposited in the joints, giving rise to very great pain, redness and swelling.

The treatment in gout is obviously to remove the cause by abstinence from meats, and to create a thorough activity of the liver. In rheumatism any cause which interferes with the digestion, particularly in the stomach, should be removed.

The entire effort in rheumatism and gout is to create combustion of the acids by plenty of oxygen, to establish a forceful circulation, and then to relieve the system through the activity of the excretory organs, kidneys, intestines, skin and lungs. The bowels should be regulated and the patient should drink freely of water, especially of alkaline waters, to cause a solution of the salts. The patient should be given regulative deep breathing to supply sufficient oxygen, should regularly exercise to create body heat by combustion of waste, should keep up daily friction baths to keep the pores of the skin active. The exercise should be sufficient to create perspiration and the body should be kept warm, so as to encourage all possible elimination through the skin.

Vomiting.

Is caused by the contraction of the walls of the stomach and abdomen. The sphincter muscle of the pyloric orifice remains closed, and the food is forced through the cardiac orifice into the oesophagus and out through the mouth.

When vomiting is violent, the abdominal muscles act energetically, a deep inspiration is taken and the glottis is closed, so that the diaphragm is firmly compressed downward against the abdominal contents and is kept contracted. The lower ribs are pulled in. The diaphragm being contracted and the glottis closed, a violent expiratory effort is made and the contraction of the abdominal muscles compresses the stomach.

The nerves which control the stomach are directly connected with those of the lungs. For this reason, vomiting may be controlled by breathing deeply and strongly, regularly distending and relaxing the abdomen, because this regular movement of the lungs and diaphragm not only frees the contracted muscles of the stomach, pylorus and duodenum, but acts upon the nerves by the natural relaxation and contraction of the muscles.

Vomiting may also be allayed by local applications of cold water and by the free swallowing of ice.

Indigestion. In various phases known as, *Catarrh of the Stomach, Dyspepsia, or Chronic Gastritis* is caused: By the use of foods difficult of digestion; poorly prepared food; highly spiced food; liquids too hot or too cold; imperfect mastication; irregularity of meals; excessive use of liquors; tea; coffee; ice water; deficient secretion of gastric juice; or it may be the result of liver, heart or lung difficulty which causes repeated congestion of the stomach, such as gall stones or cancer of the stomach.

The condition is a chronic inflammation of the mucous lining of the stomach, with inactivity or atrophy of the gastric glands, and a thickening of the mucous coats, the mucous membrane being covered with a thick coat of mucus. The result is that very little gastric juice is secreted, especially from the peptic glands.

The *Indications* are: Loss of appetite; a gnawing sensation in the stomach; at times fullness; often great depression of spirits; tenderness over the epigastrium, resulting from distention because of fermentation and gases; it is often accompanied by nausea and vomiting of undigested food, or of a colorless fluid, if the stomach is empty; the tongue is often, but not always, coated; heart-burn (sour stomach) or burning at the pit of the stomach; sleeplessness, and often vertigo; not infrequently eczema and other cutaneous diseases result. A number, or all of these symptoms may be constantly present or may be intermittent.

The *Relief* is: In regularly relaxing and contracting the walls of the stomach by physical exercise, so as to soften and open up the secreting glands that the gastric juices may be poured out and the peristaltic action be stimulated; this exercise quickens the nerve plexuses of the stomach and the vagi nerves controlling it are stimulated; a thoroughly active circulation of blood containing plenty of oxygen through the walls of the stomach is created, so that all waste as loosened by the exercise may be oxydized and carried away. While this exercise is being followed, care in diet, eliminating foods difficult of digestion, and attention to regular activity of the bowels and the liver is imperative.

One should eat more frequently, at regular hours, eating little at a time. For temporary relief diluted hydrochloric acid and pepsin may be taken to supply the elements of the gastric juices which are lacking. But this is only temporary. The permanent relief is in creating an activity which works away the mucus and opens the gastric cells that the stomach juices may have a natural flow. Small doses of common salt aid digestion, but sulphates or quinine given in large amounts disturb gastric digestion.

Washing of the stomach is desirable for a time to help to relieve the mucus collected. Where this is not practical, a cup of hot water before meals is helpful. Regular rest should be alternated with the regular exercise. Rest of mind is particularly desirable.

Correct breathing habits are imperative, because with each correct breath the stomach, liver, pancreas and spleen are exercised. Remedial physical culture is of more permanent relief than medicine.

Dyspepsia. The different forms are: Nervous Dyspepsia, Flatulence, Acid Stomach, Irritative Dyspepsia.

The *Causes* are: Bolting of food; imperfect masticating; overloading the stomach; monotonous diet; lack of exercise; depressed state of mind

from worry or nerve fatigue; close mental activity immediately after eating.

The *Indications* are: Capricious appetite; difficult digestion; acidity from the decomposition of albuminoids; heartburn; flatulence; sometimes vomiting of acrid food; often pain at the pit of the stomach; constipation; urine generally scanty and highly colored; sleeplessness at night, with often drowsiness after eating; impaired memory; hot flashes, headaches; heart irregularity.

The *Relief* lies chiefly in the regulation of the nervous system by regular exercise for complete relaxation of the spinal nerves and of the medulla oblongata, that the nerve plexuses of the stomach may rest; regulation of the diet, by taking less fat, carbohydrates and stimulants; rest, particularly after meals; regular exercise to distribute circulation, and particularly to call circulation to the stomach from the brain; regulation of the breathing to give the natural exercise for the stomach, and to supply oxygen for complete removal of waste; regulation of the bowels, especially in flatulence of the bowels; slow eating; hot water before meals.

This trouble occurs largely in business men or women who bolt the food and hurry back to mental labor, thus calling the blood which is needed in the stomach to the brain. The nerves of both brain and body are often tense and both nerves and muscles of the stomach become impoverished. They need relaxing.

Sour Stomach.

The condition popularly called Sour Stomach is due to the failure of the stomach to secrete sufficient gastric juice to prevent the fermentation of carbohydrates, taken with the food, into lactic acid. The undue formation of lactic acid may result in rheumatism. This may be due to constriction of the secreting glands because of nerve tension or to compression of the lower part of the stomach either by clothing or by incorrect habit of standing or sitting. The relief is in a normal activity of the secreting the glands.

Dilation of the Stomach.

This condition is usually caused: By the stricture of the pylorus as a result of cancer; by stoppage of the pyloric orifice, either by cancer or tumor; by the effect of constriction caused by gall stones; or by a loss of muscular tone of the stomach, whereby the peristaltic movement is not sufficiently strong to force the food from the stomach into the duodenum.

The *relief* in the former condition must be, in the removal of the pressure, in the latter condition, by the free drinking of cold water in not too large quantities, in muscular exercise for the walls and nerves of the stomach, and in cold compresses applied externally.

Gastric Cancer, Gastric Tumor and Gastric Hemorrhage all require intelligent medical treatment. They are not relieved by exercise, breathing, diet or general hygienic treatment, excepting as the proper diet may supply elements lacking in the blood, and as breathing provides oxygen for the blood and exercise creates a good circulation of the oxygen. In many cases of this nature it is not wise to heat the blood.

Gall Stones.

Gall stones are formed partly or entirely from the decomposition of the bile which precipitates crystals from the secretions in the gall bladder. Their presence, as a rule, is not recognized until the attempt of the stone to pass along the ducts, which occasions an attack of hepatic colic.

As a rule, several stones exist; as many as 600 are recorded. Gall stones are white or brown. They consist of stratified layers of crystals. The nucleus of the white stone often consists of chalk and bile coloring

matter, together with shed epithelium, mucin, bile salts and fats. Some authorities now regard gall stones as an infection.

They are sometimes, but not often, found in the cystic duct or the hepatic duct. The colic begins suddenly at the moment the gall stone passes from the gall bladder into the cystic duct.

The average person who is not familiar with anatomy believes these attacks to be in the stomach. They are characterized by piercing, agonizing pain in the region of the gall bladder, spreading over the abdomen, the right chest and the shoulder. Nausea, vomiting, feeble pulse, cool skin and tenderness of the muscles over the abdomen result, with sometimes fainting, trembling, chills or convulsions. The pains continue for an hour or two to several days, relief not being experienced until the gall stone reaches the duodenum, when it suddenly ceases. This is usually, but not always, accompanied by a yellow tone to the skin. When the stone becomes impacted in the gall duct, ulceration of the gall bladder results.

Gall stones may be removed with the knife, but for permanent relief the cause must be corrected in a better activity of the liver and a better circulation of good blood through it.

Torpid Liver or Biliousness.

This condition is the result of an abnormal fullness of the vessels of the liver with an enlargement of the cells. It may be caused by habitual constipation, especially by excess in eating and drinking, alcoholic liquors, and by excessive heat, either artificial or atmospheric. It may also be caused by diseases of the stomach or of the lungs. Long continued congestion causes degeneration of the liver.

It is usually characterized by headaches, depression of spirits, yellow tongue, distaste for food, constipation, a fullness in the region of the liver, extending to the right shoulder. In this condition, the mental faculties and the digestive system are also torpid, and the white of the eyes and the complexion are yellow, showing a presence of bile in the blood.

The relief is in a diet eliminating carbohydrates and fats, in overcoming constipation, and establishing regular habits of exercise which regulate the contraction and relaxation of the liver cells and glands, creating the secretive activity of the cells, and relieving the congested blood vessels. When attacks of congestion are severe, hot compresses over the liver relieve them. A decrease in the amount of food for a few days is beneficial.

Abscesses, Atrophy, Sclerosis, Carcinoma, Scrofulous Liver, etc., should be treated by a physician.

Intestinal Indigestion.

is a derangement in the normal functional digestion within the intestines, caused by deficient outflow of bile, pancreatic or intestinal juices, or by deficient peristalsis. It may be caused by one or all of these, as a result of insufficient exercise, worry, overeating, improper or improperly cooked food, anaemia or immoderate use of tobacco or stimulants. Some attacks are acute, as a result of an irritant in the duodenum, but the condition is usually chronic as a result of long continued abuse in above causes.

There is a decomposition of the partly digested food from the stomach, when it is not immediately acted upon by the digestive juices within the duodenum. It is usually characterized by pain occurring in from two to six hours after meals, and gases accumulate as a result of this decomposition. The pressure of this gas against the stomach interferes with stomach digestion.

Indigestion in the intestines is distinguished from that of the stomach by the large amount of gas which forms in the intestines after taking food, the abdominal pain and distention, and from the fact that one loses weight rapidly, in the former.

The gases become absorbed and exert a depressing influence upon the nervous system. The nerves are also affected by the anaemia resulting from long continued deficient assimilation.

The difficulty is characterized by depression of spirits, sleeplessness, bad dreams, vertigo, buzzing in the ears, lack of mental concentration, numbness and tingling in the extremities, dry or itching skin, and by constipation. Functional derangement of the liver usually results. Anaemia and emaciation result if the attack be long continued.

The relief is in exercise for the muscles and nerves of the entire intestinal tract creating a strong peristalsis, a freedom of the secreting glands, and exercise for the liver and pancreas to encourage the secretion of bile and of pancreatic juice, and the free pouring of these juices into the duodenum. For temporary relief, a teaspoon of common salt in a half glass of water, followed by from two to six glasses of water, is effective; but permanent relief can only come in strength of intestinal muscles and of nerves to insure a strong peristaltic movement and in an activity of the liver, the pancreas and of the secreting cells in the mucous lining of the intestines. Medicine may be given for artificial stimulus, but the relief is temporary. Deep breathing exercises for the regular action of the diaphragm upon the liver, stomach and intestines and for oxygen to create a combustion of waste is also important.

A diet of beef, eggs and milk gives the intestines rest, as these foods are more largely changed in the stomach. Weak mutton or chicken soups, with well boiled rice, may be added.

Intestinal Catarrh.

When any germ or foreign body, such as fish bones, cherry stones, unmasticated kernels of nuts, etc., excites acute inflammation of the intestinal mucous membrane, catarrh of this membrane is produced. A very strong contraction of the inflamed part filled with food takes place. If the new material passes into the inflamed parts, there is a swelling and a redness of the mucous lining, followed by an increased secretion. Swollen glands show a strong tendency to ulcerate.

This condition begins with languor, followed by dullness and fever, and paroxysms of pain result. The bowels are at first constipated, followed by diarrhoea. The bowels should be rested by easily digested food, such as milk with lime water, eggs, mutton broth or chicken soup. Cold water taken internally and applied externally also give relief. This condition, as a rule, is relieved in from four days to two weeks.

Catarrh of the Rectum.

is accompanied by a burning in the rectum, with a constant desire for evacuation of the faeces. This condition often is severe and may cause a prolapse of the mucous membrane. The stools in this condition contain much mucous. They may also be blood streaked.

If catarrh of the rectum is long continued, the tissues about the rectum become involved, which terminates in various kinds of fistula. Cold injections and injections of black coffee bring relief.

Colitis, appendicitis, cholera, dysentary, colic, etc., all require care in the attention of diet, but the cases are acute and should be treated by *materia medica*.

Appendicitis. Appendicitis is an acute inflammation of the appendix. (See Figure 9 of the foundation plate of the intestines on the Body Manikin.) This inflammation almost always spreads itself to the connecting tissue and leads to a perforation of the appendix and the development of an abscess. In the event of an abscess, the only safe treatment is by an operation, allowing the putrid matter to discharge itself outwardly. Otherwise, it will discharge within the abdominal cavity.

Appendicitis is usually caused by microbic infection or as a result of the presence of a foreign body in the appendix, which becomes incrustated with lime salts, becoming rounded in shape, resembling the cherry stone, for which it is sometimes mistaken. Some authorities state that the greater frequency of the disease is due to the grippe, which became epidemic about fifteen years ago, as the result of eating too much meat. It is stated that appendicitis is confined chiefly to countries where meat forms a large part of the food.

The relief from appendicitis is in either dissolving the hardened matter, of working it away by exercise, or, if it has gone so far as to form an abscess, by an operation. If the circulation be kept thoroughly active through the intestines, with a resultant strong peristaltic movement, the frequency of the formation of these faecal masses will be lessened, or they probably will not form.

Diarrhoea. Increased evacuation of the intestinal contents is accompanied by the watery condition of the faeces called diarrhoea. The causes are a too rapid movement of the contents through the intestine, so that there is not sufficient time for absorption along the intestinal wall. The stools are thin because the water and the digestive juices have not been absorbed along the intestines, having been hurried along by increased peristalsis. Continued diarrhoea is weakening because the nutrients in the food are not absorbed, the rapid transit of the contents causing the evacuation of certain substances which cannot be digested in so short a time.

Diarrhoea may occur as a consequence of:

First—Inflammation or catarrhal conditions of the mucous membrane, caused by indigestible food, by overeating, eating too rapidly, impure water, or by some article taken with the food which irritates the mucous lining.

Second—Increased secretion in the intestine when magnesium sulphate attracts water from the blood. The same occurs in cholera when the stools are copious and of a rice water character.

Third—Sudden mental shocks often cause diarrhoea.

Fourth—In diarrhoea following upon a cold, the vaso motor nerves of the stomach are paralyzed.

The first thing to do in treating this condition is to clean the bowels thoroughly both by drinking quantities of water and by the use of a large enema, the water for the enema being blood heat and containing a little pure castile soap. Rest is desirable and the diet must be nutritious and contain no irritating or coarse food; stimulants are desirable; milk and blackberry brandy assist in regulating the bowels. Activity of the skin and kidneys should be encouraged. A daily sitz bath of a little less than body temperature and lasting from ten to fifteen minutes is also excellent treatment.

Persons suffering from stomach and bowel troubles need much fresh air, both sleeping and waking, because of the stimulating effect of the oxygen

in the air and because the digestive process does not cease when one is asleep, although it is greatly lessened.

Constipation. There is no function of the body which requires such constant and regular care as the daily movement of the bowels, and yet there is a disposition on the part of men, women and children to neglect, defer and absolutely ignore the requirements of Nature. Every person should have a regular hour for going to stool and should remain a sufficient length of time to permit of a thorough evacuation of the bowels. If one would be well, the alimentary tract must be kept clean, by regular habit, regular exercise and proper diet.

Perhaps no one derangement of the digestive tract causes so much indirect disturbance. The fecal matter causes much infection which is communicated to the uterus and to all adjoining or connected organs.

The absorbing cells become clogged and infected and the proper absorption of food is interfered with, sometimes resulting in anæmia.

The blood becomes impure, resulting in tumors, cancers and skin diseases, and often becomes defective in some constituent element owing to the clogging of the absorbing or sucking cells of the villi.

The gases absorbed by the system have a depressing effect upon the nerves.

It is caused by a variety of indiscretions:

1. By irregular habits. (The vital organs form habits, just as we form habits of carrying the head or the hands.)

2. By the dryness of the contents caused by insufficient water in articles of diet.

3. By torpor of the liver, resulting in the diminution of the amount of bile and intestinal juices secreted. (It will be here noted that in order that sufficient bile may be secreted so that the intestinal contents are sufficiently diluted, the free activity and strength of the liver must be maintained.)

4. By a weakness of the muscles of the intestines, resulting in imperfect peristalsis.

5. By the condition of the nerves, caused by mental excitement or worry. Affections of the spinal cord sometimes, also of the brain, are usually accompanied by a slow evacuation of the intestines.

6. By obstructing the normal channel; constriction of the intestine from stricture, tumor, a hernial sac, or displacement of another organ, causing pressure upon the rectum.

7. By the character of the food.

8. By disease of the stomach and liver.

9. By clogging of the intestinal glands by mucous, which prevents the intestinal juices from pouring out.

10. By sedentary habits, resulting in sluggish circulation.

11. By pressure upon the intestines and liver due to incorrect poise, especially in sitting.

Since the constipation may arise from so many causes, the fallacy of attempting to correct the difficulty by one line of treatment is apparent.

1. The regular daily habit of attending to Nature's call at a certain hour must be fixed.

2. All obstruction in the secreting glands must be relieved by exercise which creates good circulation through the glands and brings sufficient oxygen to them to cause a combustion of the waste.

3. The muscular coat and the nerve plexuses must be stimulated by

exercise that the peristaltic movement may be strengthened. The afflicted person can generate electricity in the nerve centers by exercise.

4. The diet must be carefully regulated, admitting sufficient liquid and a normal amount of coarse food.

5. Exercise directed to the liver, creating a normal activity here, is imperative, that a sufficient amount of bile may be poured into the intestines. Bile increases peristalsis.

6. The entire nerve force must often be distributed. Direct exercise for the spinal cord is most effective. An overtensity of nerve often contracts the sphincter muscle of the anus.

7. Pressure upon the intestines must be relieved.

Spasmodic contraction of a part of the intestines may cause temporary reduction of the intestinal contents, at the same time give rise to great pain or colic. In such condition the faecal matter is usually hard and dry, owing to the water being absorbed. Hence, it is difficult of expulsion and gives rise to new resistance, owing to the contraction of the anus.

Many cathartics paralyze the bowels. Tannic acid, alum, chalk, silver nitrate and bismuth diminish the secretion of the mucous membrane.

Cathartics for relief should be prescribed by a physician and should be taken with the utmost caution, for they often do more harm than good, bringing many resultant derangements to the digestive organs.

Effect of drugs upon the intestines as given by Landois & Stirling:

1. Belladonna diminishes the excitability of the mesenteric plexus, thereby abolishing the intestinal peristalsis, producing constipation.

2. Opium and morphine in large doses paralyze the intestines and produce constipation.

3. Nicotine and many other purgatives excite the motor nerves, causing spasms of the intestines.

4. Calomel is said to control the decomposition in the intestines and to limit the absorption in the intestinal wall; the contents pass through unabsorbed, and the stools are thin and greenish with bile.

5. The salty purgatives cause fluid evacuations by retaining the water in the intestines, which would otherwise be absorbed by the blood vessels. It is said that if salt be injected into the blood vessels of animals it causes constipation, because the water is absorbed from the intestines into the blood vessels.

6. Salt excites the action of the secretory glands of the intestines and impedes absorption; thus between stimulated secretion and impeded absorption there is an accumulation of liquid within the canal which reaches the rectum and results in purgation.

Hemorrhoids or Piles.

The mesenteric vein, one of the portal veins, extends from the lower intestines to the liver. This vein branches into numbers of smaller veins, and it is because of the clogging of the circulation in the liver, or in some part of the portal veins, that the smaller veins at the anus become distended; these distended veins, with the eversion of the mucous coat of the rectum, are called piles, or hemorrhoids.

The relief from piles must be to relieve the obstruction in the circulation throughout the liver and portal venous system, creating a normal flow of blood, so that the pressure upon the veins of the anus is released.

The mesenteric vein contains no valves, and the force of gravity, as well as the clogging of the veins, cause much pressure upon the veins of the anus. Thus it is that one gets relief in case of these distended veins

when reclining, by raising the thighs, so that the blood can readily flow out of them.

Evolutionists claim that Nature intended us to walk on all fours; the portal veins would then be more on a level and there would be no need of valves.

If the particular veins which have become distended be removed by the knife, unless the cause is removed, other veins will become distended; the permanent relief can only be in exercises to create a free circulation.

Piles will not be corrected until the constipation is also relieved, because of the straining of the rectum accompanying the latter.

Hemorrhage from the bowels generally results from hemorrhoids or piles.

For temporary relief cold water or ice should be injected into the rectum, the protrusions should be kept within the anus, and the patient should lie on the back, with the knees raised. Cold compresses upon the anus bring relief.

Diabetes. When a diet consisting of starchy or sweet foods is indulged in, glycogen is formed in large quantities and accumulates in the liver. The glycogen is later converted into grape sugar, which is carried to the various tissues of the body, and by its union with the oxygen in the tissues combustion occurs and body heat is maintained. An excess of sugar in the blood above what the liver can convert into glycogen soon makes its appearance in the urine, irritating the kidneys, causing a desire to urinate frequently, a great thirst, often hunger at all hours of day or night, and excessive nervousness.

This condition is known as diabetes. A diabetic person gives off relatively more water by the kidneys than he does by the skin.

A very regular diet, with starches and sugars eliminated, regular exercise, which creates an activity of the liver, deep breathing to supply oxygen for combustion of waste, hot baths followed by friction rubs, so that the pores of the skin may be active in the elimination of waste, are the main features in the treatment of this disease.

Owing to the effect of the nerves upon the kidneys, the patient should be kept free from excitement, anxiety and mental drudgery. His mind should be pleasingly diverted.

Bright's Disease. A clogged condition of the cells of the villi of the intestines interferes with nutrition, by admitting less oxygen than necessary; then when the liver fails to bring together the elements which enter into the composition of urea, which are in combination with other elements in the blood, Bright's disease results, because of the non-elimination of these elements by the kidneys.

Exercise to create a thorough circulation and to relieve the clogged cells. Sufficient oxygen, through deep breathing, to eliminate the waste, friction baths to keep a thorough activity of the pores of the skin and heat to cause free perspiration with care in the use of meats containing an abundance of uric acid, are the surest aid in this difficulty.

There is no question about man's ability to very largely prevent the above named diseases if he will only devote the care to body hygiene that he gives to the details of business or pleasure.

LECTURES *by* SUSANNA COCROFT

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"Enter into thine inner chamber and shut the door."

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EFFECT OF HABIT UPON LIFE—FOODS

Habit is a marvelous gift of nature. Rightly used, it lengthens life and is a great conservator of energy. Wrongly developed habit is a check to growth. Habits of eating greatly influence health and these are treated in the chapter about Foods.

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